



FESHM 8025: WASTEWATER DISCHARGE TO SANITARY SEWERS

Revision History

Author	Description of Change	Revision No. & Date
Katie Kosiog	<ul style="list-style-type: none">• Added web links to regulatory standards• Updated DOE order to 458.1 and included the order's new requirements• Added storm sewer definition• Removed discussion of vulnerability analysis• Responsibilities further clarified• Removed table 3: radiological discharge limits; referred to FRCM chapter 3• Appendix A merged into Table 2	March, 2012

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	DEFINITIONS	1
3.0	RESPONSIBILITIES	2
3.2	Division/Section/Center Heads	3
3.3	FESS	3
4.0	PROGRAM DESCRIPTION	3
5.0	PROCEDURES	4
6.0	Table 1	6
7.0	Table 2.....	7
8.0	Figure 1	8
9.0	Appendix A	9



1.0 INTRODUCTION

Discharges to sanitary sewerage systems are regulated by the Illinois Environmental Protection Agency (IEPA) under authority delegated to the state by the U.S. Environmental Protection Agency. Ultimate authority is under the 1972 Clean Water Act (CWA) and amendments passed in 1977 (see APPLICABLE STANDARDS, below, for a complete list of state and federal standards). Regulations apply to every user of a sewerage system, and forbid the discharge of pollutants that might pass through publicly owned treatment works (POTW) untreated, that could create an unsafe situation for POTW workers or that might interfere with the operations of the POTW.

Illinois regulates the use of the sanitary sewerage system by enforcing the federal pretreatment program. Fermilab discharges are subject to discharge standards set by federal, state, and local regulations and ordinances. Effluents are conveyed to POTW facilities in Batavia and Warrenville/Naperville, and are subject to discharge limits set by municipal ordinance (see Table 2 for specific limits). Fermilab also holds Division/ Section specific pretreatment permits to release treated effluent to the sanitary sewerage systems from various industrial processes. These permits require periodic analysis and reporting to the IEPA.

This chapter describes procedures intended to protect the integrity of the Fermilab sanitary sewer system, and to ensure that discharge limits are not exceeded at the point where our discharge enters the public sewerage systems, i.e., at the Fermilab site boundaries.

APPLICABLE STANDARDS

[Illinois Plumbing Code at 77 Illinois Administrative Code \(IAC\) Chapter 890](#)

[Illinois NPDES regulations at 35 IAC Subtitle D](#)

[City Code for Batavia](#)

[City Code for Warrenville](#)

[DOE Order 458.1](#)

2.0 DEFINITIONS

Derived Concentration Standards (DCS): The concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 mrem (1 mSv). (DCS values are presented in [DOE Technical Standard 1196-2011](#)).

Effluent: Any wastewater discharged, directly or indirectly, to the waters of the State (e.g., via a storm sewer or a sanitary sewer).

Neutralization: Decreasing the acidity or alkalinity of a substance by adding alkaline or acidic materials.

	Fermilab ES&H Manual	FESHM 8025 MARCH 2012
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pH: A measure of hydrogen ion concentration in an aqueous solution. Solutions with a pH between 0 and 7 are acidic and solutions with a pH between 7 and 14 are basic.

Pollutant: Any substance introduced into the environment that adversely affects the usefulness of the resource.

Pollutant Load: The total amount of a pollutant in any given volume of wastewater (Concentration x Volume).

Pollution: The presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the CWA, the term is defined as a man-made or man-induced alteration of the physical, biological, or radiological integrity of water.

Pretreatment: Any process used to reduce a pollutant load before it enters the sewer system. Pretreatment of effluents requires a pretreatment permit from IEPA. Some examples of pretreatment might include neutralization, filtration, etc.

Publicly Owned Treatment Works (POTWs): A waste treatment works owned by a state or local government unit.

Sanitary Sewer: A sewer which carries sewage. Storm, surface, and ground waters are intentionally not admitted.

Sewage: The waste and wastewater produced by residential and commercial establishments and discharged into the sewers.

Storm Sewer: A sewer that is designed to drain excess rain water from streets, parking lots, sidewalks, roofs, etc.

Waste Treatment Plant: A facility containing a series of tanks, screens, filters, and other processes by which pollutants are removed from water.

Wastewater: The spent or used water from individual homes, a community, a farm, or an industry that contains dissolved or suspended matter.

3.0 RESPONSIBILITIES

3.1 ES&H Director

The ES&H Section is responsible for the development and implementation of the site wide surveillance and monitoring program to audit Division/Section compliance with both internal and external discharge limits. In all matters relating to administrative aspects of existing or pending permits, ESH will assume the role of lead communicator with DOE and the relevant agency. ESH is also responsible for preparing the reports required in Section 2.g(8) of the Contractor Requirement Document for DOE Order 458.1.



3.2 Division/Section/Center Heads

Memorandum of Understandings can be put in place to further clarify responsibilities between the ES&H Section and D/S/Cs. D/S/Cs are responsible for:

- implementing this chapter (this includes consulting their Environmental Officer (EO) to provide advice on means and methods to remain in compliance with applicable standards and this chapter),
- knowledge of the infrastructure into which effluents from their areas are discharged, characterization of their waste streams (using sampling and analytical methods that conform to Standard Methods for the Examination of Water and Wastewater or an equivalent standard), and the maintenance of auditable records for all process under their control,
- completing and submitting to FESS, Form 8025 “FESS Form for Modifications to Fermilab Sanitary Sewerage Systems” prior to any modifications to the sewerage system,
- contacting the ES&H Section when a new industrial pretreatment permit is needed,
- sampling and providing all pertinent information needed for permit applications and reports.

3.3 FESS

FESS is responsible for:

- maintaining documentation of sewer lines, connections, flows, and the condition of the collection system,
- operating the deionization resin regeneration process located in the Central Utility Building (CUB) and sampling and maintaining records needed to satisfy the terms of the pretreatment permit associated with this process,
- approving the design of additions/modifications to the Fermilab sanitary sewer system, maintaining a liaison with POTW operators in Batavia and Warrenville/Naperville.

4.0 PROGRAM DESCRIPTION

Two separate sanitary sewer systems serve Fermilab, one of which is connected to the Batavia publicly owned sanitary system, and one to the Warrenville Fox Hollow Collection system which is treated at Naperville’s Springbrook Water Reclamation Center (see Figure 1 for contributions to the two systems).

Decisions on disposal of process wastewater should always be made using any and all potential measures to eliminate or minimize wastes at the process level, including re-using or recycling process chemicals where appropriate. Please see [FESHM chapter 8022 Waste Minimization and Pollution Prevention Awareness Program](#).

Prohibitions and discharge criteria set in this chapter have been chosen to meet concentration limits set by municipalities and our pre-treatment permit, prevent the introduction of any material into sanitary sewers that would interfere with the operation of POTWs, jeopardize equipment or compromise safety. Fermilab has developed discharge criteria to aid employees in making informed decisions about the release of wastewater onsite.

	Fermilab ES&H Manual	FESHM 8025 MARCH 2012
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5.0 PROCEDURES

When new sewers or modifications to existing sanitary sewers are contemplated, the design must be reviewed through the [DP-18 process](#). No division/section/center, employee, or contractor shall establish, or permit to be established any connection between sewerage and potable water supplies. All modifications to sewers must be done by contractors licensed by the state of Illinois.

Discharge of wastewater into the sanitary sewers from processes at Fermilab should proceed only after careful analysis. Environmental Officers (EOs) from the D/S/C in which the discharge would originate should always be consulted prior to the discharge, to ensure that this chapter is being followed correctly. The general steps to be taken are as follows:

1. Determine if there are further steps that may be available to minimize or prevent the discharge from the process. Possible steps include use of alternate chemicals that have less toxic properties, using fewer chemicals, re-capturing discharge to re-use or recycle materials either here or off site.
2. Ensure that none of the prohibitions (see Table 1) would be violated by the proposed discharge.
3. Verify that the process from which the discharge is planned is not a categorical process. The only way to assure that this step is completed is to compare the extensive list of categorical processes in the federal regulations ([40 CFR 400-471](#)) with the process at Fermilab that is producing the discharge. This step should be done by the D/S/C EO in consultation with the ES&H Section. See Appendix A for examples of categorical pretreatment standards.
4. Determine the characteristics of the wastewater to be disposed of, including:
 - a. volume (gallons)
 - b. release rate (gallons per day)
 - c. concentration of all regulated constituents (milligrams per liter)
 - d. pH
 - e. radiological constituents and activity (pico Curies per milliliter)
5. Calculate the daily pollutant load(s) by applying the following formula (Note that 1 gallon = 3.784 liters):

$$\text{Concentration (mg/l)} \times \text{Volume (l)} = \text{Load (mg)}$$

Ex: 164 mg/l of copper X (400 gal x 3.784 liters/gal) = 248,230 mg Cu
(In this example we want to see if we can discharge daily a 400 gallon solution containing 164 mg/l of copper)

6. Compare the calculated load(s) with discharge criteria in Table 2. The load must be smaller than the factor in the table for the discharge to be allowable.

	Fermilab ES&H Manual	FESHM 8025 MARCH 2012
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Ex: In our example from above, the daily load from our Cu discharge, 248,230 mg is above the limit of 242,000 mg, and the discharge is prohibited.

7. Effluents with a pH equal to or below 2.0 or equal to or above 12.5 are considered Hazardous Wastes under RCRA regulations and may not be discharged without further treatment (i.e., neutralization). If the pH of a potential discharge falls between 2.0 and 5.5, or between 9.0 and 12.5, and all other discharge criteria are met, the wastewater may be discharged to the sanitary sewer at a rate not to exceed 50 gallons per day. Effluents with pH from 5.5 to 9.0 can be released if all other discharge criteria are met.
8. Effluents potentially containing radionuclides can be discharged only if they comply with discharge limits specified in DOE Order 458.1 summarized in FRCM Chapter 3, article 346.

	Fermilab ES&H Manual	FESHM 8025 MARCH 2012
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6.0 Table 1

MATERIALS PROHIBITED FROM DISCHARGE INTO FERMILAB SEWERAGE

These requirements apply at the point where the process discharge enters the Fermilab sewerage system, i.e., at the point of generation. The following substances are **prohibited in any amount** from entering into the system:

- Flammable and/or explosive materials,
- Any RCRA hazardous waste,
- Any solids or highly viscous substances (e.g., garbage, paper, cinders, sand, metal, rags, tar, wood, etc.),
- Biocides (toxins or poisons) in a quantity sufficient to disrupt the sewage treatment process,
- Storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water or unpolluted process water,
- Ethylene glycol. A 50% solution of propylene glycol may be released at a rate not to exceed 100 gallons per day,¹
- pH less than 5.5 and more than 9.0,
- Any other material that would cause any disruption to the wastewater treatment process, such as, levels of chemical oxygen demand, oil and grease (more than one hundred (100) parts per million by weight), and suspended solids, etc. that will cause an interference with the POTW. (for a comprehensive list, see [City Code for Batavia](#) and [City Code for Warrenville](#)),
- Water containing radionuclide concentrations exceeding 5 times the DCS values,
- Annual discharges of more than 5 curies of tritium or 1 curie of all other radionuclides combined.

¹ Discussed in phone conversation with City of Batavia Wastewater Treatment Superintendent, Byron Ritchason 1/12/12.



7.0 Table 2

**FERMILAB INTERNAL DISCHARGE LIMITS ON WASTEWATER SEWERAGE
DISPOSAL
(NON-RADIOLOGICAL CONSTITUENTS)²**

Pollutant	Maximum Concentration (mg/L)³	Maximum Daily Pollutant Load in a Process Effluent (in mg)
As	0.50	60000
Ba	5.00	605000
Cd	0.30	36000
Cr+3	3.00	363000
Cr+6	0.60	72000
Cu	2.00	242000
CN-	0.50	60000
Fe	5.00	605000
Pb	0.25	30000
Mn	2.00	242000
Hg	0.0005	60
Ni	2.00	242000
Phenols	0.60	72000
Se	2.00	242000
Ag	0.10	12000
Zn	2.00	242000
Propylene glycol	n/a	100 gal (50/50 mix)

² From 2001-2011, the average daily flow was 99,000 gallons per day to the Warrenville/Naperville system and 95,000 gallons per day to Batavia. As a conservative measure and because the flow varies, one third, of the average daily flow or 32,000 gallons per day is the mean daily flow used in calculating the maximum daily pollutant load. The maximum daily pollutant load is calculated by multiplying the mean daily flow by the maximum allowed concentration and rounding down to the nearest thousand.

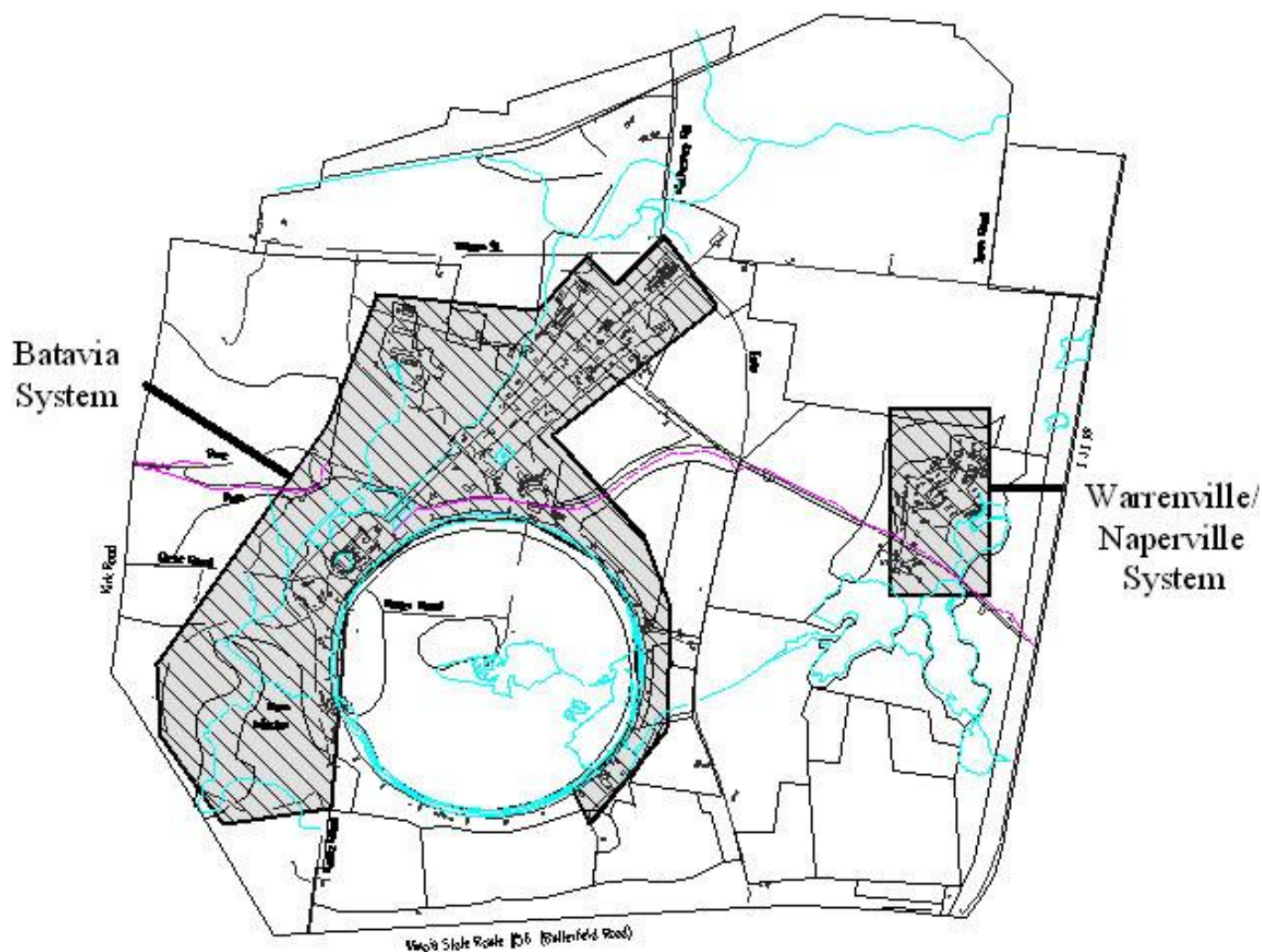
³ [City Code of Batavia](#)
[City Code for Warrenville](#)



8.0 Figure 1

FERMILAB SEWER SYSTEMS

Note: Sanitary sewerage within the shaded areas generally runs to the indicated municipal systems. It is the responsibility of Fermilab personnel to insure through their Division/Section Environmental Officer that the connection for each individual drain is known.⁴



⁴ Refer to the [Fermilab Drain Survey](#).

9.0 Appendix A

EXAMPLES OF INDUSTRIAL CATEGORIES SUBJECT TO NATIONAL CATEGORICAL PRETREATMENT STANDARDS⁵

Industry 40	CFR Section
Coil Coating	467
Electrical and electronic components manufacturing	469
Electroplating	413
Metal finishing	433
Photographic processing	459

OPERATIONS THAT ARE INCLUDED IN THE METAL FINISHING CATEGORY (The six key metal-finishing operations are in boldface type)⁶

Electroplating	Vapor plating
Electroless plating	Sputtering
Thermal infusion	Salt Bath descaling
Solvent degreasing	Electrostatic painting
Paint stripping	Painting
Vacuum metallizing	Electropainting
Assembly	Calibration
Testing	Mechanical plating
Conversion coating	Etching (chemical milling)
Printed circuit board manufacturing	Cleaning
Machining	Grinding
Polishing	Barrel finishing (tumbling)
Burnishing	Impact deformation
Pressure deformation	Shearing
Heat treating	Thermal cutting
Welding	Brazing
Soldering	Flame spraying
Sand blasting	Other abrasive jet machining
Electronic discharge machining	Electrochemical machining
Electron beam machining	Laser beam machining
Plasma arc machining	Ultrasonic machining
Sintering	Laminating
Hot dip coating	Thermal infusion
Anodizing	

⁵For federal regulations applicable to specific industries see 40 CFR Sections 405-471.

⁶Federal regulations state that if a facility conducts any of six key metal-finishing operations, discharges from those six and from the remaining 40 processes included in the category are covered by federal standards.